Programmable LED Signs for Campus Buses

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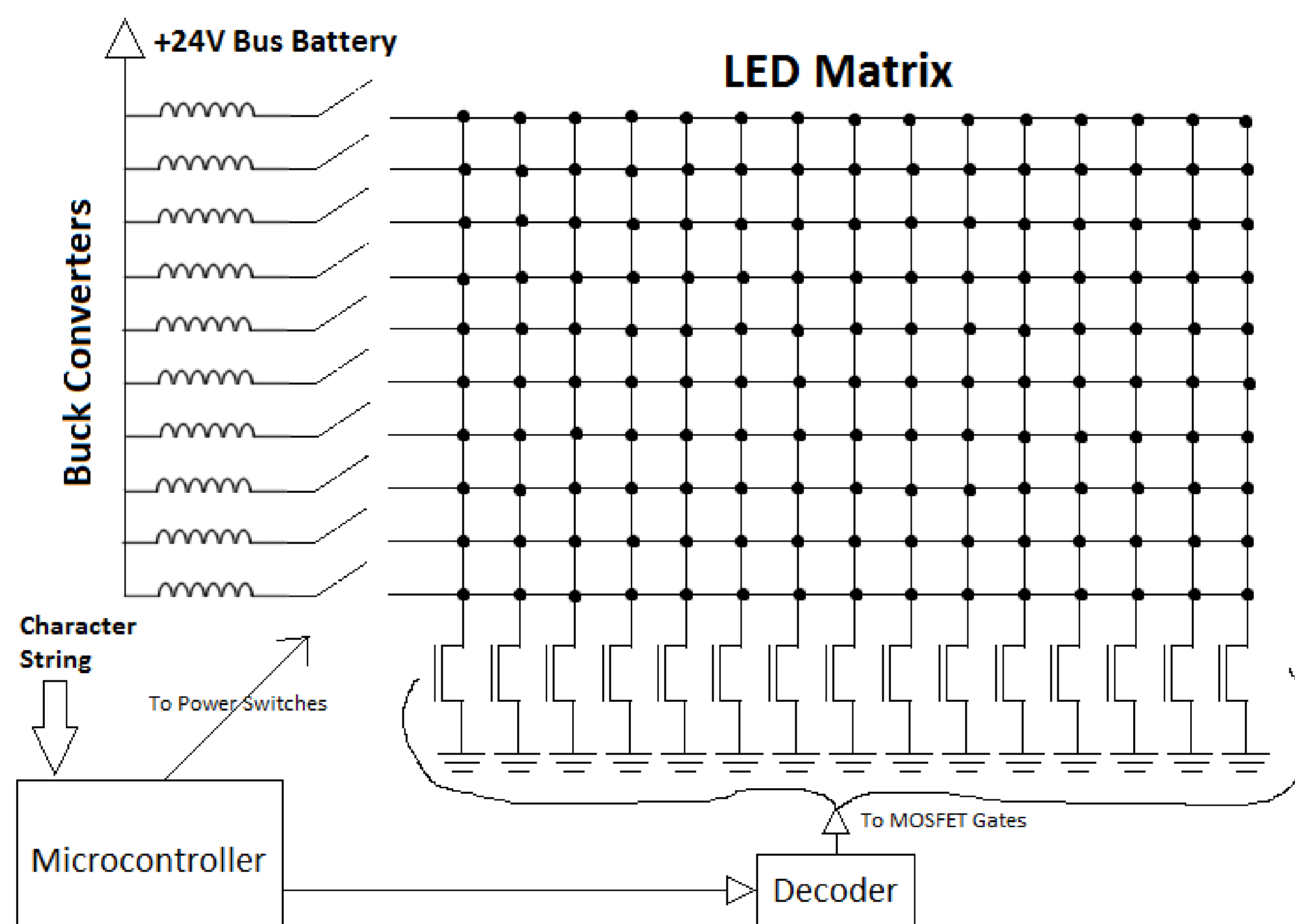
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Objective

- To build high efficiency LED destination signs for UCSC campus buses.

Above: UCSC Campus Bus with Flip-disc Sign

Motivation

- UCSC buses currently use dimly lit flip-disc signs

- Want to replace them with bright, low power signs that are easily programmable

- Microcontroller used to implement sign will also wirelessly transmit route data for Bus Tracking System (BTS) project

- Desire a mobile ad-hoc networking testbed

Results

- Working miniature prototype completed

- Sign performs better when divided into several groups of columns, due to increased cycle speed and LED brightness

Sign Design

Above: General Design Diagram

- LED matrix displays route name
- Microcontroller controls which column and rows are turned on, based on character string input
- Buck converters (high efficiency DC step-down converters) used to drive each row of LEDs
- Each column turns on one at a time, with row drivers turning on as necessary to display the characters
- Entire system powered by bus battery
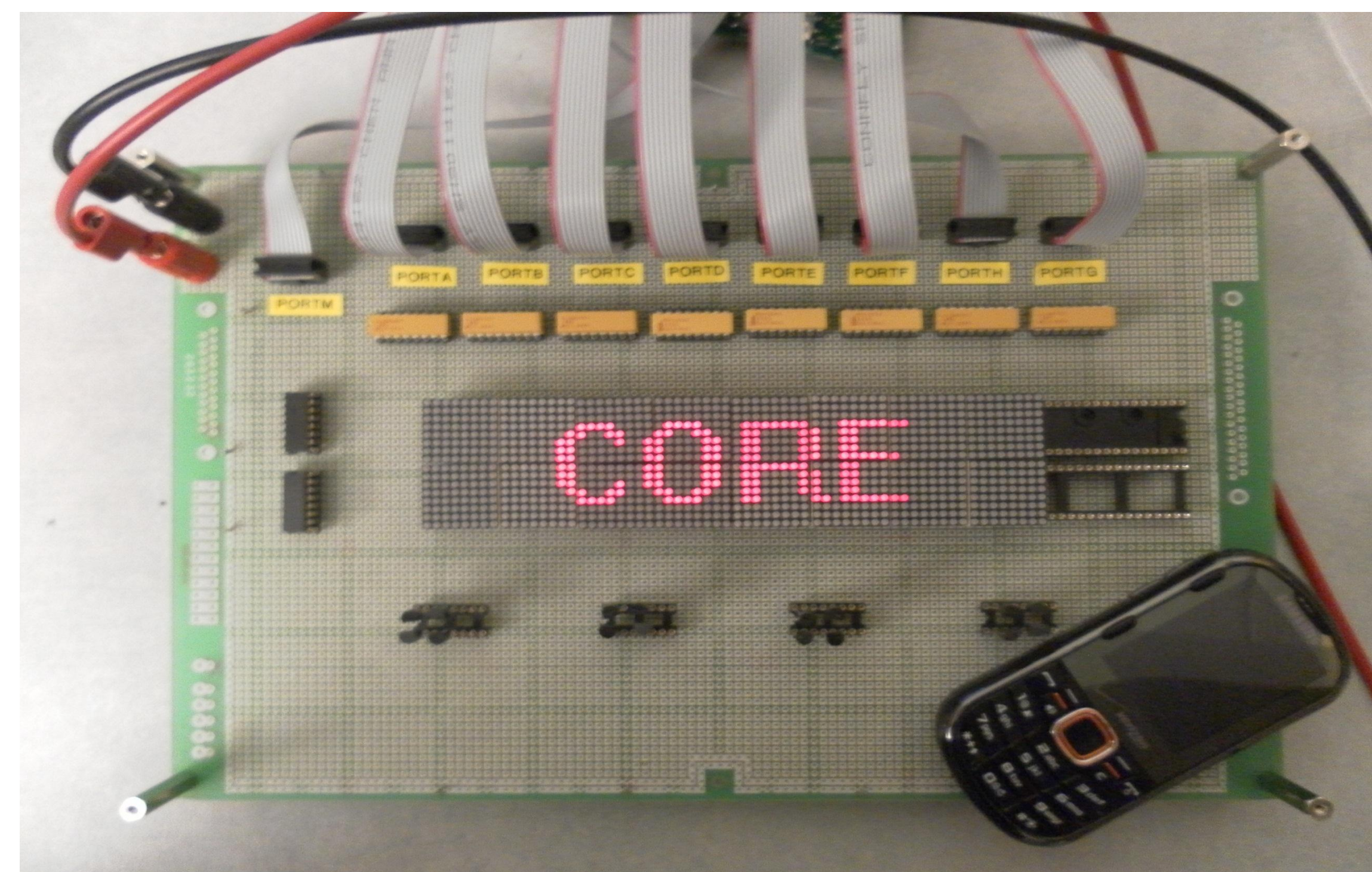
Above: Mini LED Sign Prototype

Font Processing

- Font file input to Python program (dewinfont.py) that outputs character data
- Program written to process character font data:
  - 1's and 0's of each character stored in arrays to drive correct LEDs
  - Character width data stored for text centering
  - Data formatted for use in main microcontroller program

Above: System Bold Font Data to be Processed
dewinfont.py: http://www.chiark.greenend.org.uk/~sgtatham/fonts/

Future Tasks

- Implement full-size sign

- Build control panel and sign programmer for bus driver to change route names

- Integrate microcontroller with research CPU, which serves as a mobile ad-hoc testbed node

- Set up microcontroller with 900-MHz radio to transmit route name and GPS coordinates to campus base stations